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1 CIRCULAR SAW HAVING BEVEL
2 AND DEPTH OF CUT DETENT SYSTEM

3 BACKGROUND OF THE INVENTION

4 The present invention generally relates to power hand tools, and more
5 particularly to portable circular saws.

6 Portable circular saws are in widespread use for cutting workpieces such
7 as lumber, vinyl siding, etc. Examples of such circular saws are those produced under
8 the Skil brand by the Robert Bosch Tool Corporation of Chicago, Illinois. These
9 circular saws generally include a rotary blade assembly and a motorized drive unit
10 disposed within a housing, a single handle disposed on the housing, and a base or foot
11 that rides on the workpiece during cutting operations.

12 When using circular saws, it is frequently desired to make saw blade
13 adjustments for controlling particular aspects of a cut. For example, U.S. Patent No.
14 4,856,394 to Clowers discloses a circular saw with an assembly (see FIGs. 2 and 5)
15 for adjusting a depth of cut by controlling the extent to which a saw blade moved by
16 pivoting action of the housing is positioned below a base or shoe which supports the
17 circular saw on a workpiece. The housing includes a locking means, which lockably
18 engages a plate via a locking stud extending through the housing. The circular saw
19 also includes a locking nut that is rotatable and lockable against the plate by means of

1 a locking handle that fixes the housing relative to the shoe in a plurality of continuous
2 positions.

3 It is also known to provide a portable circular saw with a bevel angle
4 adjustment mechanism for adjusting a bevel angle of cut. One example of such a
5 circular saw disclosed by U.S. Patent No. 6,202,311 to Nickels, Jr. discloses a base
6 and a saw blade arranged so that a bevel angle is adjustable relative to the base (see
7 FIGs. 1 and 2). A mounting bracket is attached to the base for relative pivotable
8 movement about an axis, which enables adjustment of the bevel angle of cut.

9 Another known circular saw having a bevel angle adjustment is
10 disclosed in U.S. Patent No. 5,452,515 to Schilling and includes a base plate, a saw
11 blade arranged so that a bevel angle is adjustable relative to the base plate, and a
12 clamping block. The clamping block is supported by the base plate and provided with
13 a turning guide slot. In addition, the clamping block also has a plurality of arresting
14 pockets arranged along the turning guide slot. A clamping screw extends through the
15 turning guide slot and a supporting arm and carries at least one axially spring-biased
16 displaceable arresting sleeve which can be positioned in one of the arresting pockets.
17 Another known arrangement for adjusting a bevel angle includes a spring-loaded ball
18 that can engage spherically-shaped recesses positioned on a mounting bracket.

19 A desirable saw blade depth mechanism and/or bevel angle adjustment
20 mechanism provides for convenient, easy and speedy manipulation to set the desired
21 saw blade depth and/or bevel angle. In some applications, an operator may need to
22 frequently change the saw blade depth and/or bevel angle setting. If it is difficult to
23 easily make an adjustment of the depth of cut or bevel angle, such difficulty can make
24 a significant difference in operating efficiency. Two significant aspects of a saw
25 blade depth mechanism and/or bevel angle adjustment mechanism are the ease of
26 effecting adjusting movements of the mechanism, and the accuracy and ability of a
27 user to consistently set desired saw blade depths and/or bevel angles.

28 Prior known arrangements for adjusting the depth of a saw blade and/or
29 adjusting its bevel angle involved locating a saw blade relative to a base at different

1 depths, or one or more predetermined bevel angles. However, such prior known
2 arrangements are not without their drawbacks. For example, many known
3 arrangements are awkward to use because the user must set a single lock while
4 simultaneously maintaining the saw at a desired saw blade depth and/or bevel angle
5 setting. This often results in discrepancies in depths of saw blade cuts and/or angles
6 of cut, especially for common cutting angles, since the depth and/or angle of the saw
7 blade are user dependent. Additionally, known bevel angle adjustment mechanisms,
8 including those having a spring-loaded ball, often tend to become clogged due to
9 wood sap, sawdust, and other debris accumulating on the adjustment mechanism.
10 Accordingly, it is desirable to have a saw blade depth mechanism and a bevel angle
11 adjustment mechanism that provide self-cleaning action, are easy to use, and provide
12 accurate saw blade depth settings and bevel angle of cut settings.

13 SUMMARY OF THE INVENTION

14 The present invention is related to a circular saw that provides accurate
15 multiple saw blade depth settings and/or bevel angle of cut settings through the use of
16 an adjustable blade depth detent mechanism and a bevel angle adjustment detent
17 mechanism. The invention eliminates the need for an operator to hold the saw blade
18 in place for at the desired depth and/or bevel angle setting while locking the blade in
19 position.

20 In a preferred embodiment, the adjustable saw blade depth detent
21 mechanism includes a saw blade depth detent and a second member having multiple
22 spaced saw blade depth recesses. The saw blade depth adjustable detent can be
23 positioned in the multiple spaced saw blade depth recesses to provide selective saw
24 blade depth settings that can range between zero and several inches, for example. The
25 bevel angle adjustment detent mechanism can be manually overridden so that any
26 incremental bevel angle settings can be set by an operator.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of the rear of a portion of one embodiment of the present invention.

FIG. 2 is a perspective view of the embodiment illustrated in FIG. 1.

FIG. 3 is another perspective view of the embodiment illustrated in FIG. 1.

FIG. 4 is a partial side perspective view of the saw blade depth adjustment detent mechanism of the embodiment illustrated in FIG. 1.

FIG. 5 is a perspective view of the front of the embodiment shown in FIG. 1 and particularly illustrating a bevel angle adjustment detent mechanism set at a zero bevel angle setting and a saw blade depth adjustment detent mechanism.

FIG. 6 is a front perspective view of the embodiment illustrated in FIG. 5 rotated to a positive bevel angle.

FIG. 7 is a perspective view of the detent holding assembly of the bevel angle adjustment detent mechanism of FIG. 5.

FIG. 8 is a perspective view of the right rear of a portion a mounting bracket and a quadrant bracket of the bevel angle adjustment detent mechanism of FIG. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present preferred embodiment provides improved saw blade depth detent and bevel angle adjustment detent mechanisms for a portable circular saw. Portable circular saws typically include a housing with a motor for driving a circular blade. A handle, which includes a switch for controlling power to the motor, typically is formed integrally with the housing, and enables an operator to control the circular saw during cutting operations. A base or foot is connected to the housing in a pivotable relationship that enables varied positioning of the saw blade relative to the foot.

Turning now to the drawings, a circular saw embodying the present invention is illustrated in FIG. 1, and designated generally at reference numeral 10. The portable electric powered circular saw 10 includes a circular saw blade 12 and a motor 14 (both shown in phantom) encased in a housing 16, and a foot or base 18. Also included is a retractable arcuate lower saw blade guard (not shown) and a stationary arcuate upper saw blade guard 20 that shield an operator from the saw blade 12. For facilitating grasping of the circular saw 10, the housing 16 also forms a curved handle 22 that is integrally formed with and extends around a portion of the housing. The handle 22 includes a trigger switch (not shown) that may be actuated to supply power to the motor 14 and rotate the saw blade 12.

FIG. 1 illustrates the saw 10 positioned with a bevel angle of zero degrees, with the circular saw blade 12 mounted to the motor 14 in a conventional manner (not shown). While also not shown in detail, the output shaft of rotational axis 24 of the circular saw blade 12 is parallel to the foot 18. The upper blade guard 20 is preferably stationary and has the lower blade guard pivotally mounted thereto. Generally, the lower blade guard is biased toward the closed position by a spring force and is mounted to the upper blade guard 20 so that the upper and lower blade guards rotate generally around the axis 24.

The portable circular saw 10 of the present invention includes a rectangular-shaped foot 18 (see FIG. 3) which is used to guide the circular saw during use. The foot 18 is a generally flat plate configured and arranged beneath the housing 16 to be pivoted relative to the saw blade 12 and the housing. A saw blade depth adjustment detent mechanism, generally designated at 26, engages a saw blade depth of cut bracket 28. The bracket 28 is connected to the foot 18 and positioned between the handle 22 and the upper blade guard 20. An advantage of the present saw blade depth adjustment detent mechanism 26 is that a user may selectively adjust the depth of cut of the circular saw 10 without having to forcibly manipulate a clamp or other mechanism to lock the saw blade 12 in position. Moreover, various saw blade depths may be selected for nominal lumber thickness values.

1 To initially set a particular depth of cut, the foot 18 can be adjusted so
2 that a saw blade depth detent 32 can engage one of various notches in the bracket 28.
3 As shown in FIGs. 1-4, the detent 32 is preferably pivotally biased against the bracket
4 28 by a spring 34 having one end portion 36 engaging the detent and an opposite end
5 portion 38 attached to a bolt 40. It is contemplated in the illustrated embodiment that
6 the bolt 40 can include multiple spring attachment grooves 42 for the end 38 to
7 provide a range of spring tensions for biasing the detent 32 against the bracket 28 as
8 best seen in FIG. 2. The bolt 40 is threaded into the upper guard 20 and has an axially
9 extending shaft 41 that preferably has a smooth surface for facilitating pivoting action
10 of the detent 32 about the shaft. The spring 34 preferably also rides on the shaft 41 of
11 the bolt 40 and biases the detent 32 against the upper guard 20. While the detent 32 is
12 preferably formed of a plastic material, such as DELRIN®, other materials may be
13 substituted and are contemplated with the present invention.

14 The lever 30 includes a handle 44 that is secured to an end portion 46 of
15 a shaft 47. The other end portion 48 of the shaft 47 passes through a washer 49 and a
16 slot 50 (best seen in FIG. 4) of the bracket 28. The shaft 47 is threadingly engageable
17 with a threaded stud 51 which is press fitted into or alternatively integrally formed
18 with the upper guard 20. In this manner, rotation of the shaft 47 toward the foot 18
19 threads the shaft onto the threaded stud 51 and locks a lower portion 52 of the bracket
20 28 against the washer 49 thereby preventing rotation of the housing 16 relative to the
21 foot 18. An L-shaped bracket 53 is connected by a bolt 54 to the lower portion 52 of
22 the bracket 28 and is secured by bolts 55 to the foot 18. Alternatively, the L-shaped
23 bracket 53 can be riveted to the bracket 28 and/or molded into the foot 18.

24 FIG. 4 is a perspective side view of a portion of the saw blade depth
25 adjustment detent mechanism 26 of FIG. 1 and depicts a mating of the saw blade
26 depth detent 32 in a groove 56 of the bracket 28. There are a plurality of spaced saw
27 blade depth recesses 56 which are configured for positioning the saw blade 12 at
28 different depth settings marked by indicia 58 to provide a user with a visual indication
29 of the saw blade depth.

1 The recesses 56 are preferably provided at commonly used saw blade
2 depths that conform to nominal lumber sizes. By way of example, the recesses 56 can
3 be positioned to provide 0, 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 1 and 2 inch saw blade depth
4 settings. The recesses 56 are formed to matingly receive and engage a ridged portion
5 60 of the saw blade depth detent 32. However, other shapes of the recesses 56 are
6 contemplated. One advantage of forming the recesses 56 in a V-shape is that during
7 saw blade depth adjustment the detent 32 provides self-cleaning action by having the
8 ridged portion 60 fully engage the recesses which facilitates removal of wood sap,
9 sawdust, and other debris from the recesses.

10 After the described position is reached, the bracket 28 and foot 18 can
11 be securely locked into position relative to the housing 16 by the saw blade depth
12 locking lever 30. The lever 30 locks the bracket 28 and foot 18 in a depth of cut
13 position when it is rotated clockwise as shown in FIG. 3. When the lever 30 is rotated
14 counterclockwise, the circular saw 10 can be adjusted to other predetermined depths.
15 For example, when a user disengages the lever 30 from the bracket 28 by rotating the
16 lever counterclockwise the foot 18 is adjustable to select a desired saw blade depth
17 according to one of the predetermined saw blade depth selections. During the
18 pivoting of the foot 18 relative to the housing 16, the detent 32 engages the bracket 28
19 at each of the recesses 56 enabling a user to rapidly position the saw blade 12 at a
20 desired depth. Moreover, it is envisioned that audio and locking indication provided
21 during the positioning of the detent 32 in the recesses 56 will enable a user to select
22 saw blade depths without referring to the indicia 58 or physically contacting the saw
23 blade 12.

24 Turning now to the bevel angle adjustment detent mechanism of the
25 circular saw 10 and referring to FIGs. 5-8, the bevel angle adjustment detent
26 mechanism is generally designated as 64. The housing 16 and the saw blade 12 are
27 positioned at a zero bevel angle setting in FIG. 5, and at an inclined angle relative to
28 the foot 18 in FIG. 6. More particularly, the bevel angle adjustment detent

1 mechanism 64 enables an operator of the saw 10 to provide different angles of cut to
2 workpieces.

3 The bevel angle adjustment detent mechanism 64 pivotally
4 interconnects the foot 18 to said housing 16 such that the housing is adjustable
5 relative to the foot through a range of bevel angles. More particularly, the bevel angle
6 adjustment detent mechanism 64 includes a detent holding assembly 66 carrying a
7 bevel angle detent 68, preferably formed of a plastic material, and a bracket assembly
8 70 which is attached to the foot 18. The bevel angle adjustment detent mechanism 64
9 enables the saw blade 12 to be positioned at a number of desired bevel angle settings
10 or a range of bevel angles that are universal to the construction industry.

11 The bracket assembly 70 includes a plurality of spaced bevel angle
12 recesses 72 positioned on an arcuately-shaped quadrant bracket 74 that is attached, or
13 alternatively integrally molded, to the foot 18. The recesses 72 are each matingly
14 engageable with the bevel angle detent 68 to provide predetermined bevel angle
15 settings within the range of bevel angles. Similar to the recesses 56 of FIG. 4, it is
16 desirable that the recesses 72 be formed in a V-shape to facilitate engagement and
17 disengagement of a ridged portion 76 of the bevel angle detent 68. Moreover, the
18 advantages disclosed for using a plastic material for the saw blade depth detent 32,
19 such as self-cleaning action, are also applicable to the bevel angle detent 68. Another
20 advantage of the present invention is that a user may adjust the saw blade bevel angle
21 rapidly and accurately, and pass several of the recesses 72 before engaging a bevel
22 angle locking lever 78 which locks the saw blade 12 at a desired bevel angle. The
23 lever 78 is configured to rotate between an open position adjacent a base portion 80 of
24 the quadrant bracket 74 and a closed position, wherein the lever 78 is rotated in a
25 clockwise direction of an arrow 82 as illustrated in FIGs. 5-7. The quadrant bracket
26 74 may also include indicia 84 of the universal bevel angle settings. For example, the
27 indicia 84 can preferably indicate positions of the recesses 72 that correspond to bevel
28 angle settings of 0, 15, 22.5, 30, 45, and 50 degrees.

1 The detent holding assembly 66 has a mounting bracket 86 in
2 operational relationship with the quadrant bracket 74 and the lever 78. A bolt 88 is
3 threaded through the mounting bracket 86 and engages a nut 90 to fix one end of the
4 quadrant bracket 74 to the mounting bracket. An axial member 92 extends through
5 the mounting bracket 86 and the bevel angle detent 68 to enable pivotable movement
6 of the bevel angle detent about the axial member in the clockwise direction of the
7 arrow 82 and the opposite or counter-clockwise direction. A spring 94 encircles the
8 axial member 92 and biases the bevel angle detent 68 toward the quadrant bracket 74.
9 It is contemplated that the tension in the spring 94 can be manipulated by multiple
10 spring connecting positions 93 on the mounting bracket 86. The mounting bracket 86
11 connects to the lever 78 via a bolt 96, which is threaded through the mounting
12 bracket. The bolt 96 also passes through a slot 98 in the quadrant bracket 74 and is
13 threadingly engaged to a nut 99 to secure the lever 78 to the quadrant bracket. In
14 addition, the bolt 96 cooperates with the mounting bracket 86 and does not rotate
15 upon movement of the lever 78. As the lever 78 is rotated in the direction of the
16 arrow 82, the quadrant bracket 74 is fixed to the mounting bracket 86. A bolt 100
17 connects the mounting bracket to the upper guard 20.

18 During the pivoting of the foot 18 relative to the housing 16, the detent
19 68 engages the quadrant bracket 74 at each of the recesses 72 enabling a user to
20 rapidly position the saw blade 12 at a desired bevel angle. Moreover, the engagement
21 action caused by the spring 94 during the mating of the bevel angle detent 68 and each
22 of the recesses 72 of the quadrant bracket 74 provides an audio indicator of the saw
23 blade bevel angle. This audio indicator enables a user to adjust the bevel angle of the
24 saw blade 12 to new angles without visually referring to the indicia 84. Moreover, the
25 universal bevel angle settings are accurately achieved without simultaneous locking of
26 the lever 78 while positioning the housing 16 and the saw blade 12 at a fixed bevel
27 angle.

28 The bevel angle detent 68 is a generally L-shaped member having a first
29 end 101 and a second end 102. The first end 101 includes the ridged portion 76 that is

1 configured for engaging the recesses 72 at the universal bevel angles. The second end
2 102 is adjacent the foot 18 and includes a radially projecting formation 104. A feature
3 of the second end 102 of the bevel angle detent 68 is that it is configured to allow for
4 manual overriding of the pre-selected bevel angle settings using a bevel angle manual
5 override leaf spring 108. The leaf spring 108 can be engaged by an operator with the
6 radially projecting formation 104, which is fixed on one end 110 to the mounting
7 bracket 86 and has another end 112 for engaging the radially projecting formation.
8 During normal bevel angle adjustment operations wherein the universal bevel angle
9 settings are selectable, the end 112 of the override leaf spring 108 is not engaged with
10 the radially projecting formation 104 which permits the bevel angle detent 68 to
11 engage the recesses 72 of the quadrant bracket 74. However, when the leaf spring
12 108 is engaged with the radially projecting formation 104, the bevel angle detent is
13 rotated in the clockwise direction of the arrow 82. Under such circumstances, the
14 bevel angle detent 68 does not engage the recesses 72 of the quadrant bracket 74,
15 which allows a continuous range of bevel angles to be selected by simultaneously
16 holding the saw blade 12 at a desired bevel angle while locking the lever 78.

17 While particular embodiments of the present circular saw have been
18 described herein, it will be appreciated by those skilled in the art that changes and
19 modifications may be made thereto without departing from the invention in its
20 broader aspects and as set forth in the following claims.